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Studies on African *Agama* VII. A new species of the *Agama agama*-group (Linnaeus, 1758) (Sauria: Agamidae) from Cameroon & Gabon, with comments on *Agama mehelyi* Tornier, 1902

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Abstract. In the course of recent taxonomic studies in the African Agamidae the West African species were examined and new species have been identified. In this publication a new species of the genus *Agama* Daudin, 1802 is described from Cameroon and Gabon. Males of the new species differ from all other known *Agama* in the unique combination of the reticulate colouration of the throat and the blue tip of tail. It is compared with the other Cameroonian members of the genus and several other *Agama* species from Africa. Additionally, the status of *Agama mehelyi* Tornier, 1902, only known from its holotype, is discussed.

Key words. Reptilia: Sauria, Agamidae, *Agama* sp. n., *Agama mehelyi*, Africa, Cameroon, Gabon, morphology, taxonomy.

Introduction

After research activities on the genus *Agama* Daudin, 1802 in the last few years many species were described, synonymised or revalidated (Padial 2005, Wagner 2007, Wagner et al 2008a, Wagner et al. 2008b). Currently, the genus contains 35 recognised species, but preliminary results (especially from the West African clade of the genus) show several cryptic taxa within the *Agama agama* (Linnaeus, 1758) complex. Therefore, many populations are under investigation and especially vouchers from Cameroon were of special interest to the authors, because the type locality of *Agama agama* has been restricted to this country.

However, until recently it was not possible to characterize the 'true' *Lacerta agama* Linnaeus, 1758, because the syntypes illustrated in Seba (1734) are not available and the proposed type material in the Museum Adolphi Friderici collection of the Naturhistoriska Riksmuseet (= The Swedish Museum of Natural History) is not identical with the illustrated specimens. Wagner et al. (2009b) clarified this situation by designating a neotype (ZFMK 15222) from Cameroon. The authors followed Mertens (1938) who restricted the erroneous type locality 'America' of *Agama agama* to Cameroon but failed to fix this decision, according to article 76 of the Internatio-nal Code of Zoological Nomenclature (ICZN 1999) by designating a lecto- or neotype. Now, after the proper de-finition of a neotype (Wagner et al. 2009b), a taxo-nomic revision of this species group is possible and the already recognised new species can be described.

Chirio & LeBreton (2007) listed seven species of *Agama* for Cameroon: *Agama a. agama* (Linnaeus, 1758); *Agama doriae bemeensis* Monard, 1951; *Agama gracilimembris* Chabanaud, 1918; *Agama mehelyi* Tornier, 1902; *Agama paragama* Grandison, 1968; *Agama sankaranica* Chabanaud, 1918 and *Agama sylvanus* MacDonald, 1981. In the adjoining countries of Cameroon, no other than the above mentioned *Agama* species occur (Wagner, unpubl. data) but Chirio & LeBreton (2007) also identified four probable new *Agama* species from Cameroon and one of them (*Agama* sp. 1) turned out to be identical with the new species recognized by us before, and we describe it herein.

Material & Methods

The type material of the new species is deposited in the Zoologisches Forschungsmuseum A. Koenig, Bonn, Zoologisches Museum für Naturkunde, Berlin and the Muséum d'histoire naturelle, Geneva. It was compared with vouchers from Cameroon and other African countries housed in those collection (see appendix) and with data from literature (Grandison 1968, Chirio & LeBreton 2007).

Measurements were taken with a digital calliper to the nearest of 0.1 mm. Measurements and scale counts were done following Grandison (1968), Moody (1980) and Moody & Böhme (1984).

Molecular data were collected to examine sequence variation between the new species and its morphologically closest relatives. A portion of the mitochondrial 16S rRNA gene of the holotype of the new species (ZFMK 87698; GenBank accession number: GU133316), a series of other specimens of the new species (no voucher; GenBank accession number: GU133315; ZFMK 73241; GenBank accession number: GU133317; ZFMK 75376; GenBank accession number: GU133318; ZFMK 83762; GenBank accession number: GU133319; ZFMK 83766; GenBank accession number: GU133320), as well as the proposed neotype of *Lacerta agama* (ZFMK 15222; GenBank accession number: GU133323) from northern Cameroon, *Agama sankaranica* (ZFMK 84992; GenBank accession number: GU133327) from an unknown locality, *Agama paragama* (ZFMK 15244; GenBank accession number: GU133321) from Cameroon, Waza, Logone et Chari, *Agama agama africana* (ZFMK 73845, ZFMK 73846; GenBank accession numbers: GU133311, GU133312) both from Senegal, Dakar-Bel Air, *Agama agama* ssp. (MHNG 2689.53; GenBank accession number: GU133310) from Benin, *Agama boueti* (ZFMK 80057) from Mauritania, 30km NW of Rosso, and *Agama finchi* (ZFMK 83652; GenBank accession number: GU133314) from Kenya, Malaba (type locality) were sequenced. Sequences for *Agama planiceps* (GenBank accession number: AF355476) and *Agama castroviejoi* (GenBank accession number: AY522929) were added to the dataset from already published sequences (Matthee & Flemming 2002, Padial 2005). *Acanthocercus atricollis* (ZFMK 41748; GenBank accession number: GU133322 Botswana, Gaborone) was chosen as outgroup.

DNA was extracted using QuiAmp tissue extraction kits (Quiagen) or a modified Chelex-Protocol (Walsh et al. 1991, Schmitz 2003). The primers 16sar-L (light chain; 5' – CGC CTG TTT ATC AAA AAC AT – 3') and 16sbr-H (heavy chain; 5' – CCG GTC TGA ACT CAG ATC ACG T – 3') of Palumbi et al. (1991) were used to amplify a portion of the mitochondrial 16S ribosomal RNA gene. PCR cycling procedure was as described in Schmitz et al. (2005). PCR products were purified using Quiaquick purification kits (Quiagen). Sequences were obtained using an automatic sequencer (ABI 377). Sequences were aligned using ClustalX (Thompson et al. 1997; default parameters) and manually checked using the original chromatograph data in the program BioEdit (Hall 1999); this resulted in a total of 505 bp for the chosen section of the 16S gene. Phylogenetic trees were calculated in the program Paup* 4.0b10 (Swofford 2002) using the neighbor-joining algorithm (NJ) and bootstrapping with 20000 pseudo-replicates to estimate node support as well as with a maximum parsimony approach (heuristic search with TBR branch swapping, stepwise random addition with 100 replicates, bootstrapping with 2000 pseudo-replicates). Paup* 4.0b10 was also used to compute the uncorrected pairwise distances for all sequences.

The following measurements and scale counts were partly used to compare the different species (see table 1): Snout-vent length (SVL): measured from mental scale to cloaca; tail length (TL): measured from cloaca to tip of tail; head length (HL): measured from jugale to rostral scale; head height (HH): measured at the jugal-postorbital region; head width (HW): measured across the jugal-postorbital region just anterior to the external auditory meatus; Midbody scales (MS): scale rows around midbody; vertebral scales (VS): number of midline vertebral scales, counted from midpoint of pectoral region to midpoint of pelvic region; dorsal scales (DS): number of midline longitudinal dorsal scales, counted from midpoint of pectoral region to cloaca; cloacal pores (CP).

Results & Discussion

Species of the genus *Agama*, unlike chameleons, the sister taxon of the Agamidae (e.g. Macey et al. 2000), are very conservative in body form, without developing ornaments like e.g. horns or ear laps. Only in some species body ornamentations like enlarged nuchal or tail crest are present. If one takes into consideration the results from the chameleons (Ziegler & Böhme 1997; Böhme & Ziegler 2008), where morphologically similar species show high variations in hemipenis structures, a similar situation in the Agamidae could be expected. In contrast, preliminary results (Böhme 1988; Wagner et al., unpubl. data) show a high level of homoplasy and conservative morphology in the hemipenis structures in the genus *Agama*. Consequently, beside from body form and hemipenis structure, there must be another mechanism of species recognition. A pre-mating mechanism was identified by several authors (Loveridge 1933, Thys van den Audenaerde 1963, McLachlan 1981, Böhme et al. 2005,

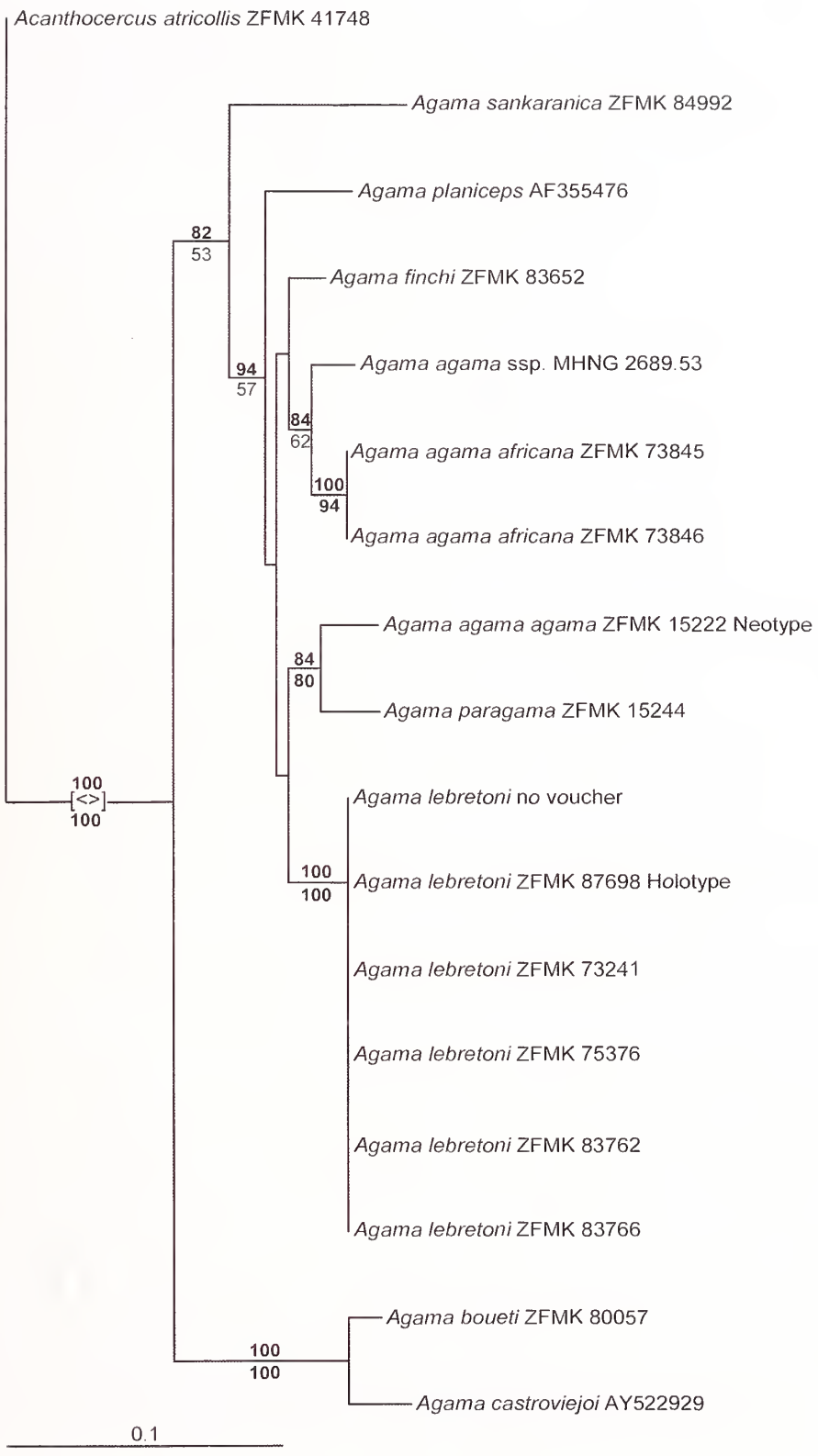

Fig. 1. Phylogenetie tree based on 505 bp of the mitoehondrial 16S rRNA gene. Values above the nodes represent neighbour-joining bootstrap (20000 pseudo-replicates) values in percent while the values blow the nodes are the corresponding maximum parsimony supports. Signifieantly supported values are in bold. Values below 50% are not shown. The braneh length from the outgroup (*Acanthocercus*) to the ingroup (*Agama*) has been shortened for visual purposes.

WAGNER 2007, WAGNER et al. 2008a, 2008b) as the colouration of head, throat, forelimbs and tail of nuptial males. In conclusion, the colouration of dominant males and, sometimes, of pregnant females can be used for the identification of the different species in the genus *Agama*, but not for analysing phylogenetic relationships. One of the main characters is the colouration pattern of the throat (JACOBSON 1992; MCLACHLAN 1981; WAGNER 2007; WAGNER et al. 2008a, 2008b). Dominant males present their throat, head and forelimbs in a behavioural context to other adult male competitors and, especially, females. Consequently, these characters are useful to distinguish different species and to compare the herein described new species with closely related taxa. Therefore, we compare the new species not only in pholidosis and morphometrics with other *Agama* species, chiefly with that ones occurring in Cameroon, but we turn our attention especially to the colouration of dominant males.

Genetics: For the genetic dataset both phylogenetic calculation methods completely agree in the topology of the recovered phylogenetic tree (fig. 1), and only differ in the degree of support recovered for the individual nodes.

The phylogenetic tree is rather well resolved with three major groups apparent. The first and basal fully supported clade includes *Agama boueti* and the only recently described *A. castroviejoi* (NJ: 100/MP: 100). The position of this clade corresponds well with the positioning of other extreme West- or North African taxa in the more complete phylogeny of LEACHÉ et al. (2009), therefore it is likely that these two taxa are part of a more comprehensive north-western clade within the genus *Agama*. The second clade is only well supported by the neighbour-joining analysis and is represented in this tree by a single species (*Agama sankaranica*), and represents the "Sahel Radiation"-clade identified by LEACHÉ et al. (2009).

The third and largest clade includes a basal unresolved polytomy because the phylogenetic position of *A. planiceps* and *A. finchi* could not be resolved with the used gene fragment. But here the three well supported subclades are of importance: the first subclade includes the proposed neotype of *Agama a. agama* and the closely related *A. paragama* (NJ: 84/MP: 80), the second subclade includes the two Senegalese vouchers of *Agama a. africana* as well as a specimen from Benin (NJ: 84/MP: 62), while the third clade fully supported clade (NJ: 100/MP: 100) contains all the included vouchers of "*Agama* sp. n.".

Table 1. Uncorrected p-distances for 505 bp of the mitochondrial 16SrRNA sequences used in this study.

	Taxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	*Acanthocercus atricollis* ZFMK 41748	–																
2	*Agama agama* ssp. MHNG 2689.53	0.1902	–															
3	*Agama agama agama* ZFMK 15222 (Neotype)	0.2073	0.0468	–														
4	*Agama agama africana* ZFMK 73845	0.1832	0.0200	0.0447	–													
5	*Agama agama africana* ZFMK 73846	0.1832	0.0200	0.0447	0.0000	–												
6	*Agama boueti* ZFMK 80057	0.2000	0.1012	0.1067	0.1011	0.1011	–											
7	*Agama castroviejoi* AY522929	0.2102	0.1087	0.1166	0.1087	0.1087	0.0241	–										
8	*Agama sankaranica* ZFMK 84992	0.1949	0.0722	0.0783	0.0701	0.0701	0.1193	0.1251	–									
9	*Agama finchi* ZFMK 83652	0.1931	0.0301	0.0317	0.0220	0.0220	0.0971	0.1047	0.0700	–								
10	*Agama lebretoni* sp. n. (no voucher)	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	–							
11	*Agama lebretoni* sp. n. ZFMK 87698 (Holotype)	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	0.0000	–						
12	*Agama lebretoni* sp. n. ZFMK 73241	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	0.0000	0.0000	–					
13	*Agama lebretoni* sp. n. ZFMK 75376	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	0.0000	0.0000	0.0000	–				
14	*Agama lebretoni* sp. n. ZFMK 83762	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	0.0000	0.0000	0.0000	0.0000	–			
15	*Agama lebretoni* sp. n. ZFMK 83766	0.1932	0.0381	0.0381	0.0381	0.0381	0.0931	0.1007	0.0784	0.0301	0.0000	0.0000	0.0000	0.0000	0.0000	–		
16	*Agama paragama* ZFMK 15244	0.2124	0.0443	0.0296	0.0423	0.0423	0.1098	0.1153	0.0827	0.0341	0.0382	0.0382	0.0382	0.0382	0.0382	0.0382	–	
17	*Agama planiceps* AF355476	0.2054	0.0471	0.0472	0.0426	0.0426	0.0940	0.0987	0.0760	0.0359	0.0449	0.0449	0.0449	0.0449	0.0449	0.0449	0.0448	–

Fig. 2. Images of *Agama lebretoni* sp. n. alive: A. Pregnant female of *Agama lebretoni* sp. n. from Mt. Nlonako, Cameroon (ZFMK 75376) | B. Non-pregnant female of *Agama lebretoni* sp. n. from Nyasoso, Mt. Kupe, Cameroon | C. Close-up of the head of the living holotype of *Agama lebretoni* sp. n. from northeast of Mamfe, Mukweeha, Amebisu, Cameroon. | D. Holotype of *Agama lebretoni* sp. n. in life

Fig. 3. Preserved holotype of *Agama lebretoni* sp. n. (ZFMK 87698) from nordeast of Mamfe, Mukwecha, Amebisu in Cameroon.

Table 1 summarizes the uncorrected p-distances for the used gene fragment. The neotype of *Agama a. agama* shows only a comparatively low genetic difference (2.96%) to its sister taxon *A. paragama*, while it differs from its western 'subspecies' *Agama a. africana* by 4.47% and from *Agama* sp. n. by 3.81%. The latter two species are separated by an equal genetic distance (3.81%). These distances are of similar magnitude than to other well established species within this large clade (*A. a. agama* [neotype]-*A. planiceps* 4.72%; *A. a. agama* [neotype]-*A. finchi* 3.17%; *A. finchi*-*A. planiceps* 3.59%). Regarding the genetic distances of vouchers which we morphologically confirmed to be members of the same taxon we find them to be genetically identical to each other; this is true both for the two *Agama a. africana* specimens as well as for all six vouchers of in the third subclade (*Agama* sp. n.).

The identified genetic structure (low to non-existent intra-clade distances and moderately higher but more or less equidistant inter-clade distances) is typical for rather young radiations. Our genetical analyses therefore supports the idea of previous studies (e.g. WAGNER 2007; WAGNER et al. 2008a, 2008b) that many of the previously recognised species in the genus *Agama* in reality comprise of several taxa, which are often very difficult to separate on the basis of external morphology alone, and the same now holds true for *Agama agama* sensu lato.

The inclusion of morphologically well established species (*A. planiceps*, *A. finchi*, *A. paragama*), which show nearly equal genetic distances to the neotype of *A. a. agama* prove that the uncovered distance of *Agama* sp. n. to all other closely related congeners confirms the specific distinctness of *Agama* sp. 1 and together with morphological evidence (see below) warrants the formal recognition of this species.

Agama lebretoui sp. n.

Holotype (figs. 2c–d, 3, 4.1)

ZFMK 87698 (field number MM075): Cameroon, northeast of Mamfe, Mukwecha, Amebisu, N 05°53.866' E 009°33.495', leg. J. Wurstner & M. Barej, September, 2007.

Paratypes

ZFMK 87694 – 697, 87699 (paratopotypes): Cameroon, Mamfe region, Mukwecha, Amebisu, leg. J. Wurstner & M. Barej, September, 2007.
ZFMK 87700: Cameroon, Mamfe, leg. J. Wurstner & M. Barej, September, 2007.
ZFMK 61243: Cameroon, Korup, Mundemba, leg. C. Wild, February 1989.
ZFMK 51686: Cameroon, Magba, leg. F. Schüttc, February 1990.
ZFMK 75376: Cameroon, Mt. Nlonako, Nguenguc, leg. H.-W. Herrmann & A. Schmitz, January 2000.
ZMB 55709, 37061: Cameroon, Makum.
MHNG 2713.29 (field number AMC-360): Mofako Balue, Rumpi Hills, Cameroon, leg. locals people, July 2009.
MHNG 2713.30 (field number AMC-248): Big Massaka, Rumpi Hills, Cameroon, leg. M. Barej & A. Schmitz, July 2009.
MHNG 2713.31 (field number AMC-009): Foyer du Marin, Douala, Cameroon, 01.07.2009, leg. M. Barej & A. Schmitz.
MHNG 2713.32 (field number AMC-178): Big Massaka, Rumpi Hills, Cameroon, 09.07.2009, leg. by locals.

Diagnosis. A fairly large species of *Agama* (total length of adult male above 25 cm), which is characterized by a reticulated pattern on the throat, a bright vertebral stripe and a deep blue tail tip in adult males. Males of the new species are distinguishable from all other *Agama*-species by the combination of throat and tail colouration. The throat colouration (fig. 4.1) is a reticular pattern of red lines, which is so far only known from *Agama paragama* (fig. 4.2), *Agama sylvanus* (fig. 4.3) and an undescribed species from Uganda (fig. 4.5). The tail colouration is unique within the genus because of the blue tip of a tri-coloured tail (see fig. 2d). Females are similar to those of other species of the *Agama agama* species complex, and can only be safely determined by their genetics.

From southern and eastern African species *A. lebretoui* sp. n. differs as follows:

From *A. planiceps*, *A. turuensis*, *A. mwanzae*, *A. kaimosae* and *A. atra* the new species differs in their unique throat colouration, the blue colouration of the tip of the tail and in having a vertebral stripe. From *A. knobeli* the new species differs additionally in not possessing a tail crest. From *A. mucosoensis* the new species differs in having a red head instead of a yellow. *A. lebretoui* sp. n. is very different in tail colouration (tri-coloured instead of banded narrow white and blue) from *A. lionotus* and *A. kirkii*.

Agama species occurring in Cameroon and Gabon differ from *A. lebretoui* sp. n. as follows:

Agama agama differs in having a black colouration of the tail tip instead a blue one in the new species. Both species also differ in characters of throat colouration: *Agama agama* has a more or less striated to uniform red throat (fig. 4.4), which is dissimilar to the reticulated throat of the new species. *A. agama* is also lacking the typical pale vertebral stripe which is present in nuptial coloured males of

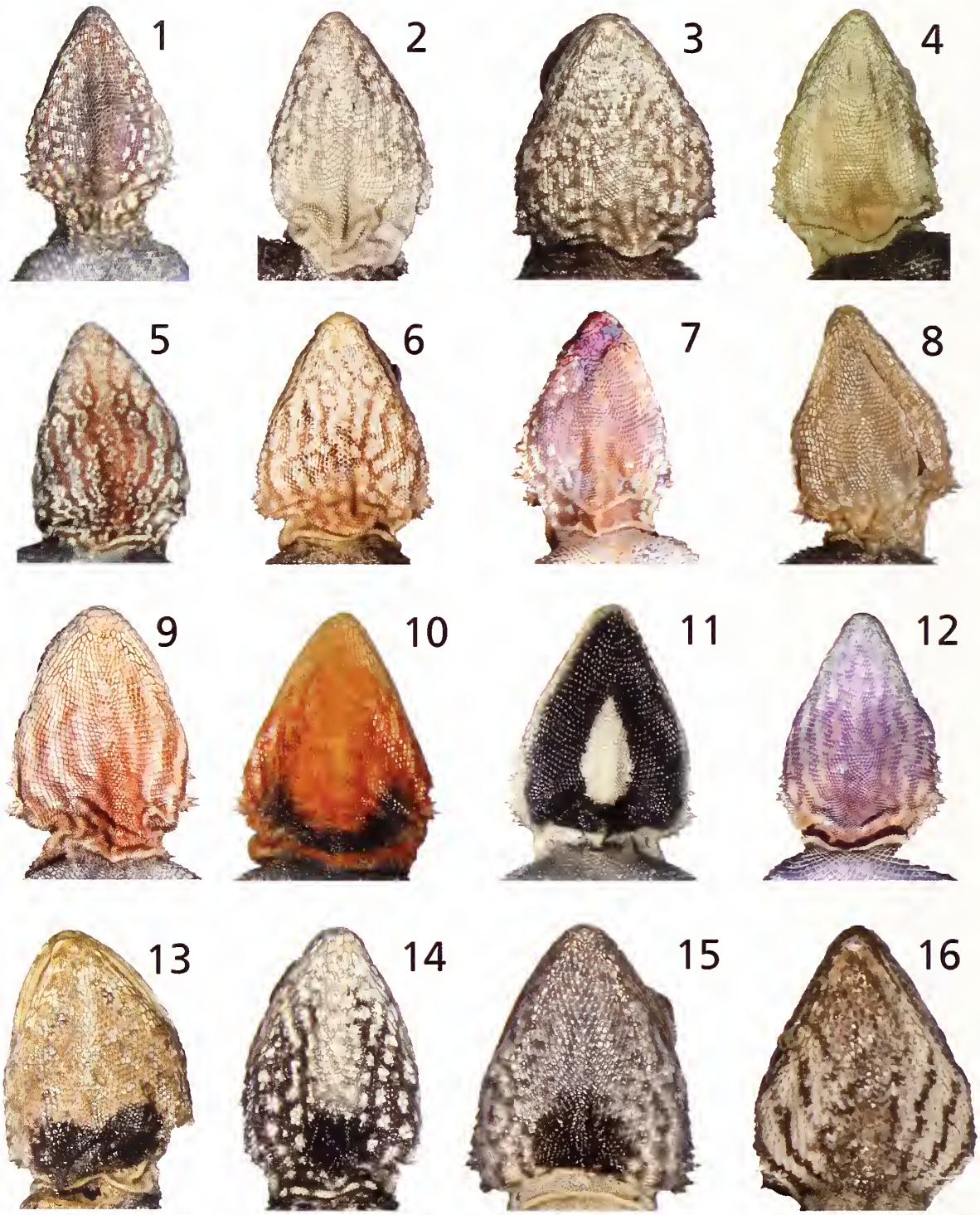

Fig. 4. Throat patterns of some West African adult males of *Agama* species:
1= *Agama lebretoni* sp. n. (holotype, ZFMK 87698), **2**= *Agama paragama* (ZFMK 15244); **3**= *Agama sylvanus* (ZFMK 40252); **4**= *Agama agama* (neotype, ZFMK 15222); **5**= *Agama* sp. n. (ZFMK 88809); **6**= *Agama a. africana* (ZFMK 20125); **7**= *Agama finchi* (NMK L2716); **8**= *Agama planiceps* (ZFMK 55062); **9**= *Agama lionotus lionotus* (ZFMK 83624); **10**= *Agama lionotus elgonis* (ZFMK 82065); **11**= *Agama lionotus dodomae* (ZFMK 83706); **12**= *Agama kaimosae* (NMK L2715); **13**= *Agama doriae bemeensis* (ZFMK 29615); **14**= *Agama doriae doriae* (ZFMK 55545); **15**= *Agama sankaranica* (ZFMK 40468); **16**= *Agama gracilimembris* (ZFMK 33719).

the new species. In contrast, *Agama agama* has a slightly lower count of scale rows around midbody. According to GRANDISON (1968) *A. agama* from Nigeria has 59 to 77 rows, whereas *A. lebretoni* sp. n. has 73 to 80 rows [23 specimens].

From *Agama doriae beneensis* the new species differs in having a different throat pattern in dominant males: *A. doriae* with a prominent black dot on the base of the throat (fig. 4.13, 4.14), instead of a reticulated throat in *A. lebretoni* sp. n. Additionally, *A. doriae beneensis* is one of the few *Agama* species which have the nostril below the canthus rostralis instead of on the canthus like in the most *Agama*'s.

Agama gracilimembris is much smaller in size (100 to 120 mm in *A. gracilimembris* in difference to more than 250 mm in *A. lebretoni* sp. n.) and does not have spinose scales around the ear opening as in the most other *Agama* species. Again, also this species differs in the colouration of the throat of adult males: striated in *A. gracilimembris* (fig. 4.16) and reticulated in the new species. In morphology, *A. gracilimembris* differs in possessing strongly keeled head scales and it is also one of the few *Agama* species which have the nostril below the canthus rostralis. However, both species are similar in the count of scale rows around midbody (70 to 85 in *A. gracilimembris* and 73 to 80 in the new species).

From *Agama paragama* the new species differs in possessing a lower nuchal crest, in having a red instead of a yellow-whitish head and in having a higher number of scale rows around midbody (Wagner, unpubl. data). Additionally, adult males of *A. paragama* show a black instead of blue tail tip. GRANDISON (1968) described the colouration of the throat of *A. paragama* (similar to the herein described new species) as 'a dark network on a cream ground which takes the form of isolated, round, cream spots' (fig. 4.2) and as dissimilar to *Agama agama* which has a 'longitudinal arrangement of darker lines or blotches'. However, GRANDISON (1968) also mentioned, that the typical throat colouration of *A. paragama* is present in both sexes, which is not comparable with *A. lebretoni* sp. n.. A similar situation exists in *Agama turuensis* and *Agama lionotus elgonis* which have a very similar colouration of the throat to each other (see fig. 4) but are recognized as distinct taxa by WAGNER et al. (2008a).

Agama sankaranica is completely different in body colouration, but also in other aspects of morphology: this species is much smaller in size and it is one of the few *Agama* lizards which have the nostril below the canthus rostralis. Additionally, *A. sankaranica* has a fewer count of scale rows around midbody (64-78 [69.6] in *sankaranica* versus 73 to 80 [76.2] in *lebretoni* sp. n.) and a very large occipital scale, which is as large as one and half diameter of the tympanum.

Agama lebretoni sp. n. differs clearly from *Agama sylvanus* in having a vertebral stripe instead of a completely blue body in *A. sylvanus*, but both species show a similar pattern of throat colouration in adult males (figs 4.1, 4.3).

Agama lebretoni sp. n. differs from the holotype of *Agama mehelyi* (for comments see below) in having a homogenous body scalation.

From the three other proposed new species mentioned by CHIRIO & LEBRETON (2007) the new species differs as follows: from *Agama* sp. 2 in the larger size; from *Agama* sp. 3 in having the nostril on the canthus rostralis; from *Agama* sp. 4 in having a vertebral stripe and completely blue forelimbs instead of red and blue coloured ones in *Agama* sp. 4.

Comparison of *A. lebretoni* sp. n. with probably valid synonyms of *Agama agama*

Agama colonorum var. *congica* Peters, 1877 was described from Chinchoxo, Cabinda, Angola. One syntype (ZMB 9196) resembles in colouration more *Agama agama*. The typical characteristics of *A. lebretoni* sp. n. (reticulated throat, white speckled body and blue tip of tail) are lacking in this specimen. The other syntype (ZMB 67193) is lacking colouration but shows a relatively large body scalation in difference to *A. lebretoni* sp. n.. It is most probable that *Agama colonorum congica* is a valid species but further investigations are needed.

Agama picticauda Peters, 1877 was described by a series of six syntypes from Ada Foâh in Ghana (Adafer in Mauritania fide LOVERIDGE 1957, which is obviously in error), from Acera in Guinea (= Accra in Ghana?) and from an unknown locality in Cameroon. DENZER et al. (1997) designated the specimen ZMB 403 from Ada Foâh as lectotype. This subadult specimen resembles in colouration and morphology *Agama agama*. Nevertheless, the paralectotype series mistakenly included an adult male of *A. lebretoni* sp. n. (ZMB 8299) from Cameroon. Therefore, because of the chosen lectotype, this taxon must be recognized as synonym of *Agama agama*. Differences between *A. agama* and *A. lebretoni* sp. n. have already been discussed above.

Description of the holotype (figs 1 c–d, 2, 4.1). Habitus stout, snout-vent length (SVL) 140.0 mm, tail length (TL) 199.6 mm, head length (HL) 36.0 mm, head with (HW) 26.0 mm, head height (HH) 15.8 mm.

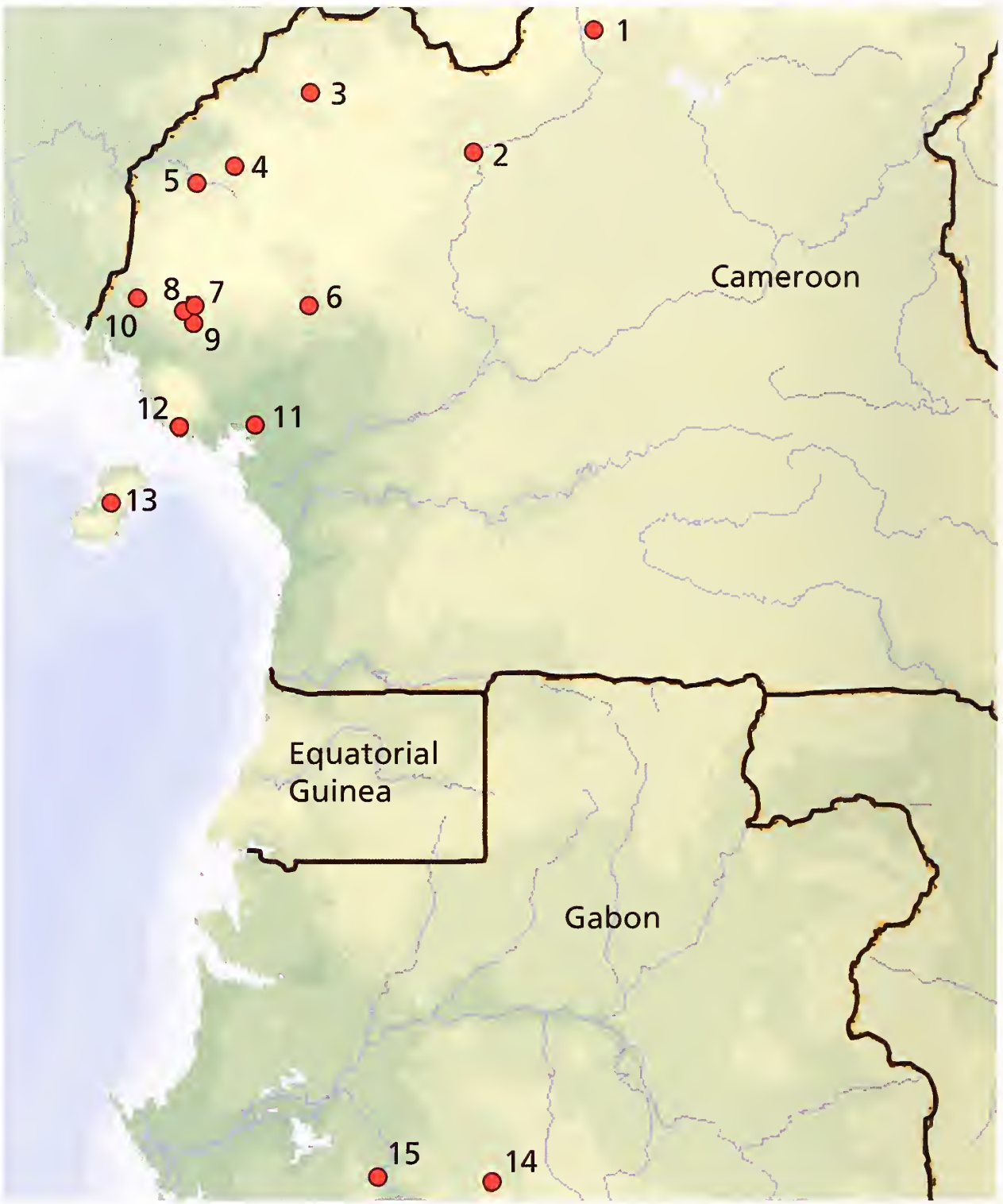

Fig. 5 Distribution of *Agama lebretoni* sp. n. CAMEROON. **1**= Makum (ZMB 55709, 37061); **2**= Magba (ZFMK 51686, 54906 – 907); **3**= Metchum, Wum (ZFMK 15194 – 15200); **4**= Amebisu [=Amebesu] [type locality]; (ZFMK 87694 – 699); **5**= Mamfe (ZFMK 87694 – 699, 87700); **6**= Nguengue, Mt Nlonako (ZFMK 69017); **7–9**= Rumpi Hills: Mofako Balue, Big Massaka (MHNG 2713.29 – 30, 2713.32); **10**= Mundemba (ZFMK 61243); **11**= Douala (MHNG 2713.31); **12**= Limbe (Victoria) (ZFMK 18891 – 894). EQUATORIAL GUINEA. **13**= Bioko Island (Fernando Poo), San Carlos (ZFMK 9353 – 359). GABON **14**= Ngouassa (IRSNB 15686 – 687); **15**= Fougamou (ZFMK 73239 – 245).

Large triangular nasal scale slightly above the canthus rostralis and pierced with the nostril in the posterior part, directed and supplied obliquely upwards. Between the nasal scales, two narrow longitudinal, keeled scales are visible, posterior followed by one smooth transverse scale. Nine supralabial scales, eight sublabial scales on both sides. Head scales between the eyes smooth, directed sideward from a midline between the eyes; head scales between posterior end of the eyes and neck keeled, directed forwards; head scales of the temporal region keeled, directed sidewards; free anterior margins of head scales with numerous sensory pits; supraocular scales smooth. Parietal shield more or less pentagonal, pineal organ visible, pierced in the middle of the shield; parietal shield surrounded by scales more or less equal in size. Ear hole large, about the same size as the eye, margin being composed by spiny scales, surrounded by five tufts (three anterior, two posterior) of more or less spiny, mucronate scales; tympanum superficial. Nuchal crest low, consisting of 17 lanceolate scales. Gular scales flat, smooth, juxtaposed and becoming smaller towards the gular fold. Dorsal body scales strongly keeled and mucronate, equal in size, in 67 scales from midpoint of pectoral region to midpoint of pelvic region. Ventral body scales smooth, slightly imbricate at their posterior margins, in 86 scales from midpoint of pectoral region to midpoint of pelvic region. Together in 79 scales rows around midbody. Tail scales strongly keeled and mucronate. One row of nine precloacal scales. Scales on the upper side of the forelimb strongly keeled, smooth on the underside, on the upper arm scales thrice as large as the dorsal body scales, becoming smaller towards the underside and the manus. 4th finger longest, digital length decreasing 3-2-5-1, subdigital lamellae keeled and mucronate. Scales on the upper side of the hindlimb strongly keeled becoming smooth on the underside, on the upper tights equal in size as the dorsal body scales becoming larger towards the lower tights. 4th toe longest, digital length decreasing 3-2-5-1.

Colouration (in alcohol after 5 months of preservation). Head and neck red. Limbs and body blue, body darker as the limbs. Posterior part of the neck, body and upper parts of the hindlimb speckled with white scales. Between the limbs with a whitish vertebral stripe. Tail at the base blue, followed by white, red and blue. Belly and underside of the limbs blue, tail anterior whitish, posterior bluish. Throat, gular fold and parts of the extreme lower head red with a white speckling, resembles at the throat a reticulate pattern.

Colouration in life. *Males*: head and nape deep red; body and limbs electric to dark blue, body and sometimes upper parts of the limbs speckled white to yellowish; whitish vertebral stripe between the limbs; tail four-coloured: blue (extending from the body), whitish in a transition zone to red and dark blue at the tip; belly and underside of limbs blue; throat with a retieulate pattern of red and white, sometimes more or less red with a white speckling. *Females*: Non-pregnant females and juveniles are vividly coloured. Ground colour is grey-brown, head and forepart of the body blotched with yellow spots, stripes and bars. Body usually with a fine and pale vertebral stripe; yellow and black framed blotches on the lateral parts; along the vertebral zone hexagonal black stripe markings visible; body is also blotched with dark dots and short stripes; sometimes an orange coloured broad stripe on the lateral parts obvious (see fig. 2b). Pregnant colouration of females is clearly different: body becomes uniform brown in ground colour; yellow to orange blotches on head more or less blurred. Body colouration is dominated by broad orange waved or serrated bands (see fig. 2a).

Variation. For some measurements and scale counts in *A. lebretoni* sp. n. see also table 1. Colouration in males and females is variable within the typical pattern of the species and depends on many different factors (see also colouration). Non-dominant males resemble the non-pregnant female respectively juvenile colouration. But also disturbed dominant males can loose their typical colouration rapidly. Dominant males vary in having a distinct or non-distinct vertebral stripe and in the intensity of spots on the body. Females vary in pregnant and non-pregnant colouration. A turnover colouration is unknown.

Etymology. The new species is dedicated to Matthew LeBreton, Yaoundé (Cameroon) in recognition of his contributions to the herpetology of Cameroon.

Distribution. The new species is so far documented by us from Cameroon, Gabon and Bioko Island (= Fernando Poo, Equatorial Guinea) (for details see fig. 5). According to Chirio & LeBreton (2007) *A. lebretoni* sp. n. (=*Agama* spec. 1) is very widespread in western Cameroon. So far only two populations are known from Gabon, but also here a more widespread distribution can be assumed. In Cameroon, the new species also occurs along the western border to Nigeria and therefore an occurrence of *A. lebretoni* sp. n. can be expected for this country.

Relationships. *Agama lebretoni* sp. n. should be closely related to *Agama agama*. As mentioned in this latter introduction this species also occurs in Cameroon with its type locality in the northern part of the country. Both species are very similar in colouration and can be distinguished by the pale vertebral stripe, the white body speckling and the blue tip of the tail in *A. lebretoni* sp. n.

Comments on *Agama mehelyi* Tornier, 1902

TORNIER (1902) described this species on the basis of a single female specimen (ZMB 18149) from Bipindihof which was collected by the botanist Georg August Zenker (1855–1922). Since that time no other voucher of the species was collected or observed. While MOODY (1980), DENZER et al. (1997) and CHIRIO & LEBRETON (2007) listed *A. mehelyi* as valid species none of these authors explained their decision about the validity. WERMUTH (1967) on the other hand stated clearly that he considered the validity of *A. mehelyi* as doubtful. Therefore, the type was examined and compared with other *Agama*-species with a heterogeneous body scalation. From (1) *A. hispida* Kaup, 1827 and *A. etoshae* McLachlan, 1981 the species differs in having a large ear hole. From (2) *A. armata* Peters, 1855 it differs in having no reticulated throat pattern and no strongly keeled dorsal scales. From (3) *A. aculeata* it differs in lacking a network pattern on the central part of the throat. The specimen resembles in scalation and colouration and especially in throat colouration pattern *A. anchietae* Bocage, 1896. Both species show dark wavy strips on the throat. A distinct colouration as in e.g. *A. aculeata* is lacking and both species are characterized by a pale vertebral stripe, four to five cross bands on the body (lacking in the preserved voucher of *A. mehelyi*) and a banded tail. Because of this striking similarities *Agama mehelyi* Tornier, 1902 is considered by us as a synonym of *Agama anchietae* Bocage, 1986.

The locality of the specimen is doubtful. 'Bipindihof' is a well known locality because of the collections made by Zenker on his own plantation. But Bipindihof is a rainforest area where e.g. *Lepidothyris fernandi* (Burton, 1836) (Sauria: Scincidae), a typical rainforest lizard was found (WAGNER et al. 2009a). In Africa, no true rainforest agamid species occur and only species of the genera *Acanthocercus* and *Agama sylvanus* MacDonald, 1981 occur in dense dry forest. Especially the members of the *A. hispida*-group, like e.g. *A. anchietae*, are typical ground dwellers of arid regions. However, between 1889 and 1896 Zenker operated the Post Office of Yaounde and he later moved to Bipindihof to build up a plantation. From 1906 he also operated the Post Office of the area. As a passionate collector Zenker collected ethnographic curiosities, photographs, herbaria, skulls, stuffed birds, mammals, amphibians and lizards. For this collections he probably also used his contacts to the Post Office to get material from other regions of Africa. Therefore, the given locality for *A. mehelyi* is most probably erroneous.

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Appendix. Material examined

***Agama agama*:** Senegal. Dakar: Bel-Air: ZFMK 73845-849; Cameroon. Diamaré, Mokolo: ZFMK 15222 [neotype]; unknown locality: ZFMK 83759 – 766. ***Agama colonorum* var. *cougica*:** Angola. Cabinda, Chinchoxo: ZMB 9196, ZMB 67193. ***Agama boueti*:** Niger. Agadez: ZFMK 33706 – 714, 36595 – 598; Assaouas: ZFMK 20050 – 051; Dabnou: ZFMK 20051; El Meki: ZFMK 20048 – 049, 20046 – 047; Agadez: ZFMK 20044 – 045. Senegal. Dakar: 17169 – 174; Mboro-sur-mer: ZFMK 17176 – 183. ***Agama d. doriae*:** Ethiopia. Eritrea: ZFMK 20847; Gorgora Land, Lake Tana: ZFMK 19454 – 455; Kaffa, Omo river: ZFMK 15861 – 864. Sudan. Equatoria, Rihi river: ZFMK 29614 – 618; Dinder Parc: ZFMK 38397 – 399; ***Agama doriae beuneensis*:** Cameroon. Adamaoua, Martap: ZFMK 15192 – 193; Diamara: ZFMK 15176; Logne et Chari, Waza: ZFMK 15177 – 191; Margui-Wandala, Gouria: ZFMK 20085 – 088, Margui-Wandala, Koza: ZFMK 15175; Margui-Wandala, Mora: ZFMK 8855; Mokolo: ZFMK 33746; Mora: ZFMK 33738 – 745. Central African Republic. Koumbala: ZFMK 33726 – 727; Ndélé: ZFMK 33747, 33728 – 733. Nigeria. Beni Sheik: ZFMK 33734 – 737. ***Agama fiuchi*:** Kenya. Malaba: NMK L/2716/1, 4, 6–7, 9–10, ZFMK 83652-656. ***Agama gracilimembris*:** Cameroon. Benoué, Boki: ZFMK 15257 – 259; Benoué: ZFMK 33717. Central African Republic. Koumbala: ZFMK 33718 – 721; Kotissako: ZFMK 33722 – 725. ***Agama kaimosae*:** Kenya: Ngoromosi: NMK L/2715/1, 3–4, ZFMK 83658 – 660; Tanzania: Tanganyika District: Mwamalasa: MHNG 877.65; MHNG 2684.001 – 006. ***Agama kirkii*:** Malawi. Mt. Mlanje: ZFMK 30696 – 697; Zomba: ZFMK 54533 – 534. Zimbabwe. Zimba, Umfuruzi: ZFMK 51254. ***Agama lebretoui* sp. n.:** Cameroon. Douala, Foyer du Marin: MHNG 2713.31; Fako (Mt. Cameroon), Limbe (Victoria): ZFMK 18891 – 894; Korup, Mundemba: ZFMK 61243; Magba: ZFMK 51686, 54906 – 907; Makum: ZMB 55709, 37061; Mamfe: ZFMK 87694 – 699, 87700; Mamfe, Mukwecha, Amcbisu: ZFMK 87694 – 699; Metchum, Wum: ZFMK 15194 – 15200; Mt. Nlonako, Nguengue: ZFMK 69017, Rumpi Hills, Mofako Balue: MHNG 2713.29; Rumpi Hills, Big Massaka: MHNG 2713.30, 2713.32. Equatorial Guinea. Bioko Island, San Carlos: ZFMK 9353 – 359. Gabon. Fougamou: ZFMK 73239 – 245; Ngouassa: IRSNB 15686 – 687. ***Agama mehelyi*:** Cameroon: Bipindihof (in error): ZMB 18149 (holotype). ***Agama paragama*:** Cameroon. Logone et Chari, Waza: ZFMK 15242 – 256. Niger. Agadez: ZFMK 36599; Tessaoua: ZFMK 33749 – 750. ***Agama* cf. *paragama*:** Cameroon. Benoué, Boki: ZFMK 15227 – 241. ***Agama picticauda*:** Ghana: Ada Foâh: ZMB 403. Cameroon: ZMB 8299. ***Agama planiceps*:** Namibia. Brandberg: ZFMK 33040 – 041; Frauenstein: ZFMK 18395 – 398; Kaoko, Werda: ZFMK 21961 – 962, Okahandja: ZFMK 2696, 2694 – 695; Omandumba: ZFMK 18399, 33007 – 009; Windhuk: ZFMK 46453 – 456. ***Agama sankaranica*:** Burkina Faso. Ouagadougou: ZFMK 39032. Mali. Kassaro: ZFMK 20053; Monsombougou: ZFMK 20056; Sandaré: ZFMK 20057; Nioro du Sahel: ZFMK 20055. Togo. Lome: ZFMK 40468 – 484, 40525. ***Agama sylvanus*:** Cameroon. Benoué: ZFMK 33751 – 754. Central African Republic. Koumbala: ZFMK 40251 – 260; Mélé: ZFMK 33766; Ndélé: ZFMK 33755 – 7654; Sibut: ZFMK 33765. ***Agama turuensis*:** Tanzania. Mount Hanang: ZFMK 74930 – 943, 82292 – 94, 82324 – 328, 82357 – 360, 82278 – 279.